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A RARE CASE OF LITHOPEDION.

By J. G. Clark, M. D.

During the month of August, 1896, a patient suffering with an abdominal tumor, dyspnœa and pain in the lower abdomen, was admitted to the gynecological wards of the Johns Hopkins Hospital for treatment, and, through the kindness of Dr. Kelly, I was given charge of the case.

The patient's history was strongly suggestive of the rupture, four years previous to her admission, of an extra-uterine pregnancy sac, with the extrusion of the fœtus into the abdominal cavity, and the physical examination revealed a stony-like mass, resembling a fœtus in form, which proved at operation to be a lithopedion.

As the formation of a true lithopedion is of rare occurrence, and as this was a typical case, I have thought it worthy of publication.

History of Case.

B. H., colored, married, age 45 years. Admitted August 8, 1896.

Chief Complaints. Pains in the lower abdomen, enlargement of the abdomen, and dyspnœa.

Marital History. Married 14 years, three children, oldest 12, youngest 7 years old.

First labor difficult, attended by a midwife, who had to call in a physician to remove an adherent placenta. Last two labors easy, slight chills and fever after birth of last child.

Menstrual History. Flow appeared first in her thirteenth year, always regular, but accompanied by much pain in the left side. For the last three years the flow has been regular, lasting 4 to 5 days.

Family History. Mother is insane, otherwise no history of hereditary disease.

Present Illness. Four years ago the menstrual flow ceased and the patient had all the symptoms of early pregnancy.

Towards the end of term her lower extremities swelled very much, and she felt so weak and miserable that she was compelled to go to bed, where she remained until long after the regular term. During the latter months of pregnancy fœtal movements were distinctly felt. About the time for her confinement she had an attack of severe pain in the left side and felt something break. Much watery fluid was passed by the vagina.

At the end of a week her physician was called, who told her that she had an extra-uterine pregnancy and advised an operation, which she declined. During the time while her legs were œdematous she became almost blind. The size of the abdomen has decreased slightly, but the pains in the left side still persist, and of late have grown more severe.

General Condition. Tall, emaciated woman, tongue slightly coated, lips and mucous membranes pale, patient seems moody and of a despondent disposition.

Bowels constipated, at times she goes a week or ten days without a movement.

Micturition painless. Appetite poor.

Examination.

Abdomen irregularly distended by a tumor which presents most prominently on the left side. It is quite hard,

only slightly movable, and is apparently connected by adhesions with the anterior and lateral abdominal walls.

The tumor lies in an oblique position within the abdomen, the upper extremity is felt beneath the left lower rib, the lower extremity being crowded down into the right inguinal region.

The general surface of the tumor is smooth, but numerous hard projections are felt over it, which are denser than the main body of the tumor.

Abdomen tympanitic over right half. Immediately below and one inch to the left of the umbilicus, where the most resistant part of the mass is felt, the percussion note is flat.

No percussion wave.

Examination under anæsthesia. Outlet relaxed, cervix in axis of vagina. Uterus normal in size, in anteposition, pushed forward against pubes by a mass posterior and above uterus.

The left tube and ovary are enlarged; nothing detected on right side except general, ill-defined bogginess.

The main body of the tumor may be pushed away from the uterus, but seems to have a slender pedicle.

The ill-defined mass in the right side, by rectal examination, feels very boggy and is in close relationship with the hard tumor.

Urinary Examination. Color clear amber, slight cloudy sediment, sp. gr. 1025, acid reaction, no sugar or albumen. A few pus cells.

Operation.

Operation by Dr. Clark, August 14, 1896.

Abdominal section for the removal of a lithopedion, double salpingo-oophorectomy for hydrosalpinx and cystic ovary on left side, and for the removal of the right tube and ovary, which were converted into an ectopic gestation sac.

Complications. Adhesions between the anterior abdominal wall and back of fœtus. Dense adhesions binding the gestation sac to the intestines. Placenta necrotic.

Incision 10 cm. in length, revealing a mottled yellow tumor closely adherent to the abdominal wall.

On releasing these adhesions and passing the hand up beneath the left lower rib, the fœtal head was felt lying in close contact with the spleen. The left arm and shoulder were closely adherent to the anterior abdominal wall near the umbilicus.

In order to facilitate the delivery of the fœtus the abdominal incision was enlarged to a point midway between the ensiform cartilage and umbilicus.

Numerous bleeding tags of adhesions were ligated.

The fœtus occupied an oblique position in the abdomen, its chest lying in close contact with the aorta, from which it derived a distinct pulsation impulse.

The fœtal head was grasped and gently delivered from the abdominal incision, after which the umbilical cord was cut close to its placental attachment in the pelvis. On inspecting the pelvic structures the fimbriated end of the tube was found adherent to the ectopic sac, having been apparently torn from the body of the Fallopian tube at the time of the primary rupture.

The secondary or adventitious sac was situated between the folds of the broad ligament. On the floor of the pelvis a large placenta was attached. The larger portion of the sac projected up into the abdominal cavity, and was densely adherent to the vermiform appendix, cæcum and intestine. Secondary rupture had occurred in the superior wall of the sac, the umbilical cord projecting through it into the abdominal cavity.

The placenta was very friable, and on attempting to detach it, broke up into small bits, requiring its removal piecemeal. The ectopic sac was dissected free from the intestine and its attachments in the pelvis, and enucleated with the right tube. The ovary could not be distinguished in the necrotic mass.

A large cystic ovary and hydrosalpinx were removed from the left side.

Abdominal cavity irrigated with 5 litres of salt solution. Abdomen closed with buried silver and subcutaneous cat-gut sutures.

Pulse at beginning of operation 120, at completion 90 beats a minute.

Patient made an uncomplicated recovery, temperature at no time after operation rising above 100° F.

Discharged 28 days after operation, well.

Dr. Barnum's History of the Case.

In a private letter, Dr. Barnum, of Lancaster, Va., has given the following account of the case:

I remember the case of Mrs. Harris very well, owing to the fact that it is the only one of the kind ever seen by me. I was called to see the case in October, 1892. I found the patient weak, nervous, despondent, and at times with a mind decidedly unbalanced. From her and her husband, who is a colored man of intelligence and good standing, I learned that she became pregnant the previous November. There was the usual suppression of the menses, morning sickness, quickening, filling out of the breasts, and all of the signs which she, as the mother of several children, recognized as indications of the pregnant condition.

In August she was taken with perfectly normal labor pains and the colored midwife was sent for. Neither the patient nor her colored attendant suspected that anything was wrong until forced to believe it by the delay in the delivery.

At my first visit to the patient, two months later, an external examination showed her pregnant condition.

Digital examination, however, revealed the uterus of a non-pregnant woman.

At a still later visit I was able to grasp a knee of the fœtus through the abdominal walls of the mother.

A rigid questioning of both husband and wife failed to elicit any history of previous abnormal pregnancy or miscarriage.

As this pregnancy had not been interrupted by any unusual sickness, I gave it as my opinion that this was a case of abdominal pregnancy; or if it at any time had been one of tubal pregnancy, the tube must have ruptured early in the pregnancy.

At my first and at all of my subsequent visits I urged the patient to go to the hospital for treatment. As she was not willing to do this, I gave her tonics and remedies to improve her mental condition. She gradually improved, and has employed no physician, I think, during the past year. Allow me to thank you for your letter announcing the operation which confirmed my diagnosis.

Pathological Report.

Extra-uterine fœtus removed from the abdominal cavity four years after the rupture of the gestation sac.

Fœtal measurements:

Occipito-mental diameter,	12.2 cm.
" frontal "	9.2 "
Sub-occipito bregmatic diameter,	9.2 "
Bitemporal diameter,	7.9 "
Biparietal "	7.9 "
Circumference of head,	30. "
" " shoulders,	32. "
Length of fœtus,	42. "
Weight of fœtus,	4¾ lbs.

The fœtus is entirely covered with a thin translucent membrane which is easily peeled off.

Only the general outlines of the face can be distinguished, the eyes, nose, mouth and ears being entirely covered in with the membranous covering, through which the hair of the fœtus can be seen as a black mat.

Scattered throughout the fœtal envelope are numerous yellowish white spots composed of a fatty, saponaceous material.

The cheeks are quite prominent, the left being much more so than the right.

The skin covering the face and forehead is of a brownish red color resembling burnt leather, slightly mottled, and is firm and resistant, having lost all of its pliability.

On cutting into the skin at this point the knife encounters numerous gritty particles, but the general body of the skin is composed of adipocere.

The occiput and a part of the parietal bones may be seen projecting immediately beneath the membranous covering.

The parietal bones overlap the occipital, and the jagged sutures feel like saw-teeth.

The skin covering the left side of the head is of a white, bleached appearance, similar to the washerwoman's skin.

The membranous envelope, which is probably the remains of the amnion, is closely attached to the fœtus, but can be peeled off. It is ten millimetres in thickness and has no visible blood-vessels when held up to the light.

The arm on the right side is closely glued to the body, and the space between the axilla and elbow is entirely obliterated.

The right forearm is flexed on the arm, and the fingers on the hand.

The dorsal tendons of the hand are seen as glistening cords beneath the mummified fœtal skin.

The left forearm is half-way flexed upon the arm and presents the same general appearance as the right side

The feet are flexed upon the legs, the legs upon the thighs, and the thighs partially upon the abdomen.

There is a considerable accumulation of adipocere and calcareous matter in slightly raised plaques over the lower extremities.

The genital organs are entirely hidden by the enveloping membrane, so that it is impossible to differentiate the sex of the fœtus without further dissection. The entire posterior aspect of the fœtus is covered with glistening white organized tags of adhesions which have connected the fœtus with the maternal tissues. On floating these adhesions out in water they are seen to form a thick wavy veil.

On dissecting this layer of adhesions, loose numerous fatty plaques are seen in the skin.

The dorsal vertebræ form a prominent ridge, and at points where the spinous processes shimmer through the translucent skin are seen to be in a cartilaginous state.

The skin of the buttocks and the underlying fat and gluteal muscles have undergone saponaceous change, with here and there patches of calcareous matter sparingly interspersed through the external portions of the tissues

The umbilical cord is shrunken to about half its usual size and contains many calcareous nodules.

Median incision from the neck down to and through the symphysis pubis reveals the following condition: Superficially the body is covered with a membranous layer which can be peeled off easily, next comes the thick brawny bacon-like

skin, and beneath it the brownish red muscle which contains multiple fatty areas about the size of millet seeds.

The peritoneum is of a dull slate color, like that seen in an old post-mortem subject.

The intestines are collapsed, soft, pliable, and, except for the shrinking of the tissues from absorption of the watery elements, appear to have undergone little or no change.

The liver is of a light brownish red tint interspersed with slate colored patches.

On section the liver is found to be much denser than normal, the stroma is of a greenish brown color, with many minute yellowish spots.

The lungs are atelectatic and have a dense fleshy feeling. The color is brownish red, resembling the color of the liver.

On section, gritty particles are encountered with the knife.

The heart is collapsed, wrinkled, and of a dark brown color.

The spleen is small and dense.

On freeing the genital organs of the enveloping membrane the fœtus is found to be of the male sex.

Microscopical Examination. Lungs: the air spaces are small and the epithelial lining is not visible, but appears to be changed into fatty detritus and star-shaped crystals.

The connective tissue between the air spaces is pale, opaque and of a uniform homogeneous appearance, the separate connective tissue fibres not being distinguishable.

Interspersed throughout the connective tissue septa are many star-shaped crystals.

The muscular tissue of the heart still maintains its characteristic form, although undergoing marked fatty degeneration. No calcareous changes visible.

The general histological structure of the liver is unchanged, although the liver cells are undergoing fatty degeneration.

Diagnosis. Extra-uterine fœtus undergoing saponaceous mummification and calcareous changes. (Lithopedion.) The calcareous change is limited to the enveloping membrane, skin and lungs, the remainder of the internal organs showing only those changes due to fatty degeneration and absorption of their watery constituents.

Kuchenmeister makes the following classification of the calcareous changes which may occur in an extra-uterine embryo after its death:

Lithokelyphos, a condition in which the fœtal envelopes alone undergo calcareous changes, the fœtus shrinking to a mummified mass after the absorption of the amniotic fluid.

Lithokelyphopedion, a condition in which the fœtal envelopes and those parts of the fœtus which come in contact with the membranes undergo calcareous changes.

Lithopedion, a condition in which the fœtus after its expulsion into the abdominal cavity undergoes calcareous change, beginning externally in the vernix caseosa.

In ectopic pregnancy cases which survive the primary or secondary rupture of the gestation sac and are not subjected to operation, the embryo may be disposed of in various ways, depending upon its age and the maternal conditions surrounding it.

Complete absorption only occurs when the embryonic tissues are largely composed of watery elements and the bones are yet in a cartilaginous state; it is therefore highly improbable that an embryo more than three months old ever completely disappears in this way.

In order to arrive at an approximate idea concerning the ability of the human peritoneum to dispose of a young extra-uterine embryo when expelled into the abdominal cavity, Leopold* made an extremely interesting experimental study upon rabbits.

For this purpose he selected four series of pregnant animals at different stages of pregnancy, from which he removed the embryos by abdominal section and implanted them in the peritoneal cavity of other rabbits.

The embryos were of the following sizes: 2.5 cm. long, 5 to 6 cm. long, 8 cm. long, and the fully matured fœtus with intact membranes.

Some of the animals became infected and died from purulent peritonitis.

In these cases the rate of absorption was much more rapid than in those where the peritoneum remained normal.

Although the many experimental studies upon the function of the peritoneum have demonstrated its phenomenal absorptive ability, we are hardly prepared for Leopold's statement that when there was an accompanying peritonitis an embryo 2.5 cm. long was so completely absorbed by the end of the second day that no further trace of it could be found; that a 5-cm. long fœtus at the end of 24 hours showed only a small mass of bones, the epidermis and all of the internal organs having been absorbed; that of an 8-cm. long fœtus there remained only a small mass of tissue consisting of the skin, paws and nails and the shrunken internal organs and skeleton; and finally that the fully matured fœtus with its enveloping membranes was little less rapidly absorbed.

As the rupture of an ectopic pregnancy sac is in the majority of cases a sterile process, the results obtained in those experiments of Leopold in which there was no accompanying peritonitis probably more nearly indicate the approximate rate of absorption in the human being.

In those animals the absorption was quite as effective, although much slower.

After a few days embryos 2.5 cm. long were very much softened; in two instances, at the end of fourteen days they were only the size of a lentil, after thirty-four days they were still smaller, and at the end of fifty-two days were either completely absorbed or only a small trace of them could be found.

From these experiments Leopold concludes that a small embryo may be absorbed completely.

The accumulated observations upon the clinical course of extra-uterine pregnancy tend to prove that the great majority of cases will rupture within the first two months of pregnancy, and also that probably many accidents of this kind occur without the patient dying from their effects or being subjected to operation.

The natural course, therefore, in these cases will be for the embryo to be absorbed completely. It is only when the primary rupture is delayed beyond the third month, or when the embryo survives the rupture and continues to develop in an

*Archiv f. Gyn., vol. XVIII, p. 53.

adventitious sac until a secondary rupture occurs, that a lithopedion is likely to be formed.

In these cases the extruded embryo may lie free in the abdominal cavity as a non-irritant foreign body, or as is more likely, a wall of adhesions will form about it and thus shut it off from the peritoneal cavity. The close proximity of these encapsulated masses to the intestines and rectum renders them liable to infection at any time.

In the event of this complication extensive suppuration will occur and the fœtus quickly becomes skeletonized, and its bones may be discharged through a fistulous track into the rectum, vagina, bladder, or through the abdominal wall. It is only in the non-infected cases that mummification, saponaceous and calcareous changes take place.

The first cases of lithopedion recorded excited the liveliest curiosity and speculation among physicians as to their origin, and usually the conclusion was reached that no law governed their formation and that their origin was due to some mysterious or occult influence.

As an evidence of the views held by these earlier physicians, we find the case referred to by Spachius prefaced by the following lines: "Deucalion cast stones behind him and thus fashioned the human race, hence comes it that nowadays the tender flesh of babes is formed of stone."

In 1881 Kuchenmeister* reported a case in which a lithopedion had lain in the abdominal cavity of a woman 57 years. He carefully reviewed the literature bearing upon the subject of lithopedion, covering the period between the report of Albosius's case in 1582 and the time of the publication of his article in 1880.

From the fact that a lithopedion has always been considered such a unique production it is safe to assume that more of these cases in proportion to the number which have actually occurred, have been reported than of almost any other pathological anomaly, and yet from 1582 until 1880 Kuchenmeister was able to collect only 47 cases of mummified, skeletonized and calcified fœtuses, and of this number only a few can be accepted as true lithopedions.

Many of the earlier cases were dignified by special titles, such as the Lithopædion Senoense, Das Heidelberger Lithopädion von Nebel (1767), Das Berliner Lithopädion von Walter (1775), Das Dresdener Lithopädion von Seiler, Sen. (1819), etc.

Notwithstanding the great activity in the field of abdominal surgery since 1880, the year of Kuchenmeister's publication, comparatively few additional cases have been reported, a fact which still further proves that they are of very rare occurrence. If we select those cases from Kuchenmeister's review which represent a definite epoch or interesting fact in the history of this subject, we find that Albosius's case (1582) was the first reported. Varnier and Mangin's case (1785) was the first of double ectopic fœtation with the formation of a skeletonized fœtus and a lithokelyphos. Von Weinhardt's case (1802) was the first successfully operated upon by abdominal section, Bonisch's case (1821) the first successfully removed through the vagina, Lee Heiskell's case (1828) the first reported in the United States, and Kuchenmeister's case (1880) the one of longest standing. The case which I now report is the largest lithopedion yet removed by abdominal operation followed by recovery of the patient.

The cases just referred to are of sufficient interest to merit a short resumé of their histories.

In Varnier and Mangin's case (1785) there were two extra-uterine fœtuses of different ages found at autopsy.

A woman who had borne twelve children again became pregnant and went on to an apparently normal labor, March, 1752. The labor pains continued many days; water and considerable blood were expelled from the uterus, causing her to become weak and faint. After this false labor the patient gradually recovered, the abdomen, however, remaining enlarged. Eighteen months later she again had bleeding, from which she recovered, and continued well until the time of her death, 1785, in her 75th year.

At autopsy a white, moderately hard tumor of 5½ pounds weight was found adherent to the abdominal wall, intestines and mesentery. The outer surface was partly calcified, and within the tumor a male fœtus with its placenta and umbilical cord was found. The joints were flexible, not friable; the extremities were hard, but still fleshy and not calcified. The muscles were hard and brown; the skin dense and yellow.

Ovaries and tubes normal. Close to the left uterine wall and between it and the rectum, a hard, chalky tumor the size of a hen's egg was found, which contained a thick reddish slime and the bones of a two or three months fœtus.

This sac communicated through perforations in the uterine wall with the uterine cavity.

Von Weinhardt's case, 1802, should occupy a prominent place in the history of abdominal surgery on account of the courage exhibited by this barber-surgeon in attempting such a hazardous operation.

In this case the patient gave a history so characteristic of the rupture of an extra-uterine pregnancy sac that V. Weinhardt, after making an examination, not only diagnosed her true condition, but advised an operation, which he performed Sept. 25, 1801.

After exposing through an abdominal incision the tumor mass, the surface of which was covered with veins, he delivered it with a "flesh hook." Within the mass the fœtal bones could be felt distinctly. The foetus was removed, but no attempt was made to enucleate the placenta. The umbilical cord was brought out through the abdominal incision. The abdominal wound was dressed with cotton and a solution of balsam Peru and adhesive plaster. The patient recovered.

In this case the fœtal envelope alone had undergone calcareous changes, the fœtus having become skeletonized. Kuchenmeister therefore classified it as a lithokelyphos.

In the case of Bonisch (1815) the fœtus had lain in the abdomen for seven years before the operation.

The patient first noticed a large lump in her left side, accompanied by pain which she referred to the region of the umbilicus. This was her eighth pregnancy. The fœtal movements had been quite vigorous, and at full term all of the usual symptoms of labor came on and continued for three days, after which they ceased and her breasts decreased in

*Archiv f. Gyn., vol. XVII, p. 153.

size. For five weeks she had a bloody vaginal discharge. At the end of nine months the menses returned. The patient did not wholly recover, but suffered from dysuria, constipation, occasional abdominal pains, and emaciation. In 1817 and in 1819 she again bore children, but the pain and emaciation which had previously existed continued, and in addition she had a foul-smelling vaginal discharge.

At the time of the operation a sharp bone (frontal bone) projected into the vagina; this was first removed, accompanied by the escape of pus, after which the cranium was crushed with bone forceps and removed piecemeal. The left arm was then torn off with a hook, but remained attached by adhesions to the abdominal wall.

The bone was removed, leaving the soft parts behind. The hook was then fastened to the right arm, and all of the parts removed except the right thigh. This bone with the adherent parts was removed later.

The patient recovered, but had an occasional discharge of calcareous and cheesy masses, and the soft parts which were left behind formed a hard swelling over the pubes. Involuntary urination still continued.

Lee Heiskell's case is of interest merely because it was the first reported in the United States. The lithopedion was removed at autopsy and weighed four pounds and six ounces.

The clinical history of Kuchenmeister's case was reported by Hirt, an accoucheur in Zittau, in V. Siebold's Journal für Geburtshülfe in 1834.

The patient gave birth to a dead fœtus in 1819, after which she again menstruated regularly until the end of the year 1823, when symptoms of another pregnancy appeared.

During the second half of her pregnancy she began to have much pain, which increased as the fœtal movements grew stronger, until she did not have an hour free from suffering. At the time of her expected confinement she experienced labor-like pains for a few days.

On Oct. 25th, after eating a light midday meal, she suddenly had a feeling of heart anguish, cramp and lancinating pain in the abdomen accompanied by vomiting.

After this time she became very sick and no longer felt the fœtal movements or labor pains. Three days later Hirt was called and found the woman in an unconscious condition, with all the signs of a septic fever associated with an inflammatory attack in the abdomen. On account of the tympanitic condition of the abdomen Hirt was only able to make out rather indefinitely the transverse position of the fœtus above the umbilicus.

After an examination of the uterus, which he found empty, he felt convinced that this was a case of "abdominal pregnancy." On account of the serious condition of the patient and the death of the fœtus he did not consider the recovery of the patient possible without an operation, but under the administration of medicines "nature asserted herself," and Hirt says, "Truly I had the pleasure of seeing a slow recovery set in." After this time the patient had an ill-smelling diarrhœa which gradually disappeared. Milk appeared in the breasts on the 21st day and was present for 14 days. Nine weeks after the first day of her illness she had a bright red flow of blood mixed with pieces of skin and fibres.

From this time on the patient made a good recovery, and with the exception of pain which she noticed in certain movements of the body as in bending far forwards, and an occasional sharp, sticking pain in the right side, she suffered no inconvenience. Ten years after the attack Hirt examined the patient and found the fœtus still in a transverse position, the head towards the right side of the mother. Through the posterior wall of the vagina a part of the fœtus which he took for one of the upper extremities could be felt.

In 1846, 13 years after Hirt's last note, Kuchenmeister first saw the case and found a tumor one and a half times as large as a head adherent to the abdominal wall in a transverse direction, making a prominent conical tumor near the umbilicus. The tumor was closely adherent to the abdominal wall and was only movable in so far as the abdominal wall was movable. The fœtal parts could not be recognized. The uterus was normal in size and form and at most slightly anteverted. By the vagina the tumor could not be felt.

The patient continued in good health until 1880, when she died in her 88th year. The autopsy was performed by Kuchenmeister, June 3d, 1880. The body was greatly emaciated, and the abdomen presented a prominent conical appearance, most marked near the umbilicus. The tumor was intimately adherent to the mesentery and anterior abdominal wall, requiring the knife to separate the adhesions. The tumor was in part directly adherent beneath and at the sides to the adjacent intestine, and in part connected by band-like adhesions with the more distant intestines and especially with the uterine appendages. The broadest adhesions resembled the bursted tubal sac. From one part of the tumor a fœtal foot projected, the skin over which was dry and the tendons stood out prominently like those seen in dried anatomical preparations. The tumor was hard, inflexible and calcified. The placenta was soft and easily differentiated from the ectopic sac.

On opening the sac a full-term mummified fœtus was found. It was very much shrunken, the face was distorted but not calcified and was covered by the right arm. The umbilical cord was wound around the thorax of the fœtus and easily visible. All of the inner organs could be recognized without difficulty. The general appearance of the scalp, cranium, brain, lungs, heart, pericardial sac, diaphragm, spleen and liver was preserved, but the intestines had shrunk into an unrecognizable mass.

A microscopical examination of this and another specimen was made by T. Wyder, who found only calcareous deposits in the skin and amniotic sac and not in the internal organs. The various tissues were mostly easily recognized and in part were wholly preserved. In the denser tissues the cell elements were most resistant and retained their normal appearance and arrangement. In all localities where fat had previously existed margarine and cholesterine crystals were found.

As Kuchenmeister's table possesses considerable historical interest I have rearranged it according to the chronological report of the cases and append it to this paper.

Since the publication of Kuchenmeister's paper cases have been reported by the following writers, but none of them

possess any special points of interest over the cases found in his report:

Dahlmann, Archiv f. Gyn., 1879, Vol. XV, p. 128.
Oettinger, Progrès Med., 1884, Vol. XII, p. 196.
Sarrante, Archiv de Tocol., 1885, Vol. XII, p. 237.
Oppel, A., Münch. med. Wochen., 1888, Vol. XIII, p. 151.
Stonham, Tr. Path. Soc. London, 1886–7, Vol. XXXVIII, p. 445.
Hammer, Prag. med. Wochen., 1888, Vol. XIII, p. 151.
Fales, W. H., Boston M. and S. J., 1887, Vol. CXVII, p. 131.
Tarnier, Bull. Acad. de Méd., 1889, Vol. XXII, p. 57.
Schotte, G., Münch. med. Woch., 1890, Vol. XXXVII, pp. 471, 489, 503.
Wilson, E. H., Brooklyn M. J., 1891, p. 515.
Elbing, R., St. Petersb. med. Woch., 1890, Vol. VII, p. 299.
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Hofmeier, Sitzungs. d. phys.–med. Gesellsch., Würzburg, 1892, p. 134.
Gottschalk, Canad. Pract., 1893.
Patellani, Ann. di Obstet., Milano, 1893, Vol. XV, p. 817.
Dean and Marnoch, J. Anat. and Physiol., London, 1893–94, p. 77.
Fabbrovich, Gazz. d. Osp. Milano, 1894, Vol. XV, p. 890.
Djemil-Bey, Ann. de Gynéc. et d'Obstet., Paris, 1894, Vol. XLII, p. 333.

KUCHENMEISTER'S TABLE OF CASES REPORTED BETWEEN THE YEARS 1582 AND 1880.

Case No.	Year of observation.	Name of observer.	Number of births before the ectopic pregnancy.	Time when labor pains or symptoms of rupture occurred.	Length of time fœtus was retained.	Lithokelyphos.	Lithokelyphopedion.	Lithopedion.	Skeletonization.	Saponification.	Primary site.	Age of the woman at death.	Escape of water from uterus.	Escape of decidua from uterus.	Return of menses.	Other births after the ectopic pregnancy.	Remarks.
1	1582	Albosius.	None.	....	28 yrs.	..	1	..	..	..	Normal uterus.	66 years.	Yes.	Yes.	....	....	
2	1659	Densius, Pont à Mousson.	"	6th month.	?	..	1	..	..	..	....	....	....	....	....	....	
3	1661	Schnorffs in Dole.	....	9th month.	....	..	..	1	..	..	....	53 years.	....	...	Yes.	....	
4	1675	de Blegny (Toulouse).	10	Full term.	28 yrs.	..	..	1	..	..	Tube.	25 years.	....	Prolonged purulent discharge	....	....	Pregnancy in the uterine end of the Fallopian tube. Fœtal head in fundus uteri.
5	1719	Bompard.	....	7th month. 2 days in labor.	15 yrs.	..	..	..	1	..	Uterus?	....	....	....	....	....	Skeletonization and softening of the fœtus with partial spontaneous extrusion.
6	1720	Orth, Steinkind, Von Leinzell.	....	Full term. Labor pains 3 to 4 weeks.	51 yrs.	..	1	..	..	..	Probably in one horn of uterus.	91 years.	....	....	....	2	
7	1728	Bianchi.	2	In the 9th month.	15 yrs.	1	..	..	..	..	Ovary.	....	...	...	....	....	
8	1741	Bromfield.	....	Full term.	9 yrs.	1	..	..	..	..	Uterus, perforation of the cervix uteri.	....	....	. ..	....	...	
9	1747	Middleton.	....	Full term.	16 yrs.	..	..	1	..	..	Fimbriated extremity of tube.	....	Yes.	.. .	....	4	
10	1748	Bourdon and Chamerau in Troyes.	1 miscarriage.	Full term. Labor pains 2 days.	30 yrs.	1	..	..	..	..	Right tube.	61 years.	....	....	...	....	Two incisor teeth in jaw.
11	1767	Heidelberg case of Nebel.	2	Full term.	54 yrs.	..	..	1	..	..	....	91 years.	Yes.	...	Yes.	2 abortions.	Patient recovered after many weeks.
12	1775	Walter, of Berlin.	1	9th month.	22 yrs.	..	..	1	..	..	Right ovary.	....	...	....	....	....	
13	1784	.....	2	Full term. Labor pains for 3 days.	8 yrs.	1	..	..	..	..	Left tube.	45 years.	....	Yes.	Two years later.	....	
14	1785	Varnier and Mangin.	12	Full term. Labor pains for many days.	33 yrs.	1	..	..	1	..	One fœtus in abdom. cavity, the other in saccommunicating with uterus.	75 years.	Escape of water with blood.	Probably decidua.	18 months later.	....	One fœtus fully developed (9th month), the other 3 months old.
15	1786	Mühlbeck.	1	11th month.	14½ yrs.	..	..	1	..	..	Uterus.	....	Yes.	....	...	....	Fœtus died in the 7th month.
16	1798	Cheston (case 1).	3	Full term. Labor pains 3 weeks.	50 yrs.	1	..	..	..	..	Uterus unicornis unicollis (mit Nebenhorn).	80 years.	....	...	....	....	
17	1798	Cheston (case 2).	....	Full term.	4 yrs.	..	.	..	1	..	Normal uterus.	Operated upon in 29th year.	Flow of fetid water for 15 months	....	4 years after operation.	. ..	
18	1800	Denmann.	1 full term. Many miscarriages.	9th month.	32 yrs.	..	..	..	.	..	...	....	....	...	...	....	History of case very imperfect.
19	1802	Von Weinhardt.	....	Near the 7th month.	7 yrs. to the time of operation.	1	..	..	..	..	Probably extra-uterine.	....	Yes, one week.	Blood and fleshy matter.	...	....	Recovery.
20	1805	Cadwell.	No.	Full term. Labor pains one day.	26 yrs.	..	..	1	..	..	Retained in uterus.	....	....	Yes.	....	. ..	Died from operation performed through the cervix.
21	1806	Grivel.	....	....	....	..	..	..	.	..	Abdomen.	83 years.	....	. ..	. ..	....	

KUCHENMEISTER'S TABLE OF CASES REPORTED BETWEEN THE YEARS 1582 AND 1880.—*Continued.*

Case No.	Year of observation.	Name of observer.	Number of births before the ectopic pregnancy.	Time when labor pains or symptoms of rupture occurred.	Length of time fœtus was retained.	Lithokelyphos.	Lithokelyphopedion	Lithopedion.	Skeletonization.	Saponification.	Primary site.	Age of the woman at death.	Escape of water from uterus.	Escape of decidua from uterus.	Return of menses.	Other births after the ectopic pregnancy.	Remarks.
22	1810	Mascagni.	9	At the end of the 9th month.	14 yrs.	1	..	..	..	..	Right tube.	53 years.	....	Blood.	Yes.	....	
23	1819	Seiler.	No.	...	46 yrs.	..	..	1	..	..	Abdomen.	80 years.	....	....	....	. ..	Spontaneous delivery through vagina and rectum.
24	1819	Praël.	1	No symptoms of labor.	28 yrs.	..	.	.	1	..	Uterus.	68 years.	...	....	....	....	
25	1820	Bruns.	....	....	50 yrs.	..	..	..	..	..	....	....	....	..	....	....	History of case imperfect.
26	1821	Bönisch.	7	Full term, 3 days long.	7 yrs. up to time of operation.	..	..	1	..	..	....	....	....	....	....	....	Recovery. Fœtus removed through the vagina.
27	1825	Cruveilhier.	3	7th month.	47 yrs.	1	..	..	..	..	R. tube and ovary	82 years.	....	....	Yes.	2	
28	1828	Lee Heiskell.	....	....	40 yrs.	1	..	..	..	..	Abdominal cavity	....	....	..	....	....	
29	1832	Stoltz.	1	End of the 9th month.	2 yrs.	..	..	..	..	..	Posterior wall of uterus and its adductor. Possibly in one corner of uterus.	. .	Slight.	Small amount of blood.	.. ....	....	
30	1836	Case reported from the city of Danzig, author not cited.	....	Labor pains at full term.	40 yrs.	1	..	..	..	..	Abdominal cavity.	....	....	....	....	....	
31	1839	Bondet.	1	Labor pains at full term.	29 yrs.	1	..	.	..	..	Abdominal cavity.	....	....	....	....	...	
32	1841	Löscher.	2	Full term. Labor pains continued 2 days.	11 yrs.	..	..	1	..	..	R. ovary.	..	Yes.	....	Yes.	...	
33	1849	Virchow.	....	...	26 yrs.	1	..	..	..	..	L. ovary.	?	....	....	...	....	
34	1854	Will.	1	Full term.	10 yrs.	1	..	..	..	..	L. ovary?	39 years.	....	Bloody discharge.	..	2	
35	1855	Stein in Steinau.	1, 10 years before.	Full term. Labor pains 14 days.	½ yr.	..	..	1	..	..	Regio. mesar.	....	....	....	...	....	
36	1859	Von Genns and Schrant.	7 full terms, 3 abortions.	..	12 yrs.	1	..	..	..	..	R. ovar. and parov.	44 years.	....	...	....	....	
37	1864	Playfair.	2	Full term.	2 yrs.	..	..	..	1	1	Tube and ovary.	....	....	....	Yes.	....	Vienna paste applied to the sac per vag. Before it was eroded the patient died.
38	1866	Platzer.	....	7th month.	½ yr.	1	..	..	..	..	Fimbriated end of left tube and l. ovary	....	....	4 months after the death of the fœtus.	....	....	
39	1866	Turner.	....	....	½ yr.	1	..	..	..	..	In one cornu uteri.	....	....	....	....	....	The fœtus was more than a half year over term before it was delivered.
40	1872	Wurm in Teinach.	1 full term, 2 abort.	7th month.	2 yrs.	1	..	..	..	..	Tube and ovary.	....	....	Nine days after the death of fœtus.	....	...	
41	1872	Bossi.	....	....	6 yrs.	1	..	..	..	1	L. ovary.	....	....	....	....	4 times delivered artificially.	
42	1876	Chiari.	7	8th month.	49 yrs.	1	..	.	..	..	L. ovary absent.	82 years.	....	....	....	..	
43	1876	Galli.	2	7½ months.	37 yrs.	1	..	..	..	..	....	....	....	...	....	1	
44	1877	Deschamps.	1	Full term. Labor pains for 3 days.	7 yrs.	..	..	..	..	..	Uterus.	....	....	....	....	1	
45	1878	Chiari.	...	....	5 yrs.	1	.	..	..	..	Canalis interconaliculi.	....	....	....	...	....	The fœtus was undergoing suppuration.
46	1878	McCollom.	Many.	Full term. Labor pains 36 hours.	11 yrs.	..	..	..	1	..	....	....	....	....	After 3 months.	....	
47	1880	Kuchenmeister.	1	Full term. Few days.	57 yrs.	1	..	..	..	..	Left tube.	88 years.	....	Nine days after the death of fœtus.	Yes.	...	

ON TUBERCULOSIS OF THE ŒSOPHAGUS, WITH THE REPORT OF A CASE OF UNUSUAL INFECTION.

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Renewed attention to the subject of tuberculosis of the œsophagus has shown that this organ is not so often spared in tuberculous affections as was at one time believed. Thus, in a critical review of the subject published in 1893, Dr. Flexner,* who reported a new case, was able to collect from the literature up to that date only eighteen undoubted cases. Since his publication there have appeared, so far as has come to the writer's notice, twenty-eight additional cases. Of these twenty-eight cases it is worthy of remark that nine were described by one observer, Mazzotti.†

Another case from this pathological laboratory is to be added to the list, and now that the affection is no longer recognized as of great rarity, its report is suggested as much by the peculiar distribution of the tubercles as by the pathological condition itself. It seems worth while at the same time to re-collect all the cases and to consider the classification with reference to their ætiology.

The classification suggested by Flexner is as follows:

I. Instances in which the tuberculous process arises through continuity or contiguity of structure.

(*a*) Where a caseous bronchial gland or group of glands becomes adherent to the œsophagus and ulcerates into the latter.

(*b*) In consequence of perforation of abscesses associated with caries of the vertebræ.

(*c*) Where tuberculous ulcers of the pharynx pass down and invade the œsophagus.

II. Cases in which there exists in the œsophageal mucous membrane a previous lesion to be regarded as predisposing to the tuberculous infection.

III. Instances in which (*a*) the œsophagus is affected in the course of a general disseminated miliary tuberculosis, and (*b*) in which there is infection of the mucous membrane from tuberculous sputum where no previous lesion existed.

Of the nineteen cases collected by Flexner,‡ eleven belong to the first class, two to the second, and six to the third. In the first group are included the cases of Weichselbaum (1), Beck (2), Penzoldt (3), Orth (2), Pitt (1), and Zenker (2); in the second group those of Eppinger (1) and Breus (1); while the third class includes the cases of Mazzotti (3), Spillman (1), Frerichs (1), and Flexner (1).

Of the six cases comprising the last group, one only occurred in the course of a disseminated miliary tuberculosis giving rise to an eruption of miliary tubercles in the œsophagus. This case, which was reported by Mazzotti,§ is the only published account of miliary tuberculosis affecting the œsophagus.

The additional twenty-eight cases which have been reported since 1893, including cases omitted from Flexner's original publication, can be divided so that thirteen fall in the first, three in the second, and twelve in the third class.

A.—INFECTION BY CONTINUITY OR CONTIGUITY OF STRUCTURE.

1. Selenkow* reported a case of partial destruction of the œsophagus by tuberculosis. Gastrostomy was followed by impaired nutrition and death. In the lungs were found old tuberculous lesions, which, approaching the root on the right side, invaded the lymph glands. The latter became adherent to one another, forming a diffuse caseous mass both anterior and posterior to the œsophagus, and finally ulcerated into the anterior wall of the tube below the bifurcation of the trachea. A cavity about the size of a hen's egg was produced in the enlarged and caseous lymph glands, which was filled with detritus and into which the lumen of the œsophagus opened freely. Two distinct perforations occupying an area 5 cm. long and separated by a narrow strip of tissue existed. The lumen of the œsophagus was constricted in the lower segment and was only about half the size of the upper part. Although no bacteriological or histological examination was made in this case, the tuberculous nature of the lesions can scarcely be doubted.

2. Voelcker† reports the case of a boy, aged 9 years, in whom the post-mortem examination showed a mass of cretaceous glands at the hilum of the right lung. On opening the œsophagus a perforation was found on the anterior wall, a little to the right of the middle line and a little below the level of the bifurcation of the trachea. The opening was about 5 mm. in diameter; the edges were puckered and led into a cavity in which caseous material could be seen.

Voelcker has also collected from 2504 autopsies in the post-mortem records of the Hospital for Sick Children, four other cases of tuberculosis of the œsophagus associated with general tuberculosis, to which he briefly refers.

3–4–5. In three of these cases caseous glands ruptured into the œsophagus.‡

Letulle§ reports three cases, one of Londe and two of his own.

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*Flexner: Tuberculosis of the Œsophagus. Johns Hopkins Hospital Bulletin, IV, 1893–4.

†Mazzotti: Nuove osservazioni intorno alla tuberculosi dell' esofago. Dal Bulletino d. Scienze Mediche di Bologna, VII, ser. VII, 1896, 553–579.

‡Flexner: Op. cit.

§Mazzotti: Revista Clinica, Januar, 1885.

*Selenkow: Kasuistische Mittheilungen a. d. ausser-städtischen Hospital. St. Petersburger med. Wochenschr., IX, 1884, 491.

†Voelcker, A. F. Caseous Gland opening into the Œsophagus. Tr. Path. Soc., Lond., XLII, 1890–91, 87.

‡The additional case was one in which an oval ulcer, three-quarters of an inch long, existed at the level of the bifurcation of the trachea; but in this case the note says: "The muscular coat remains, the floor is smooth as if healed up, although in the neighborhood of a caseating gland. The ulceration, as far as could be seen, had not started from or been in any way caused by the gland." The ætiology in this case must certainly be regarded as doubtful.

§Letulle: Lesions tuberculeuses de l'œsophage. Bull. Soc. Anat. de Paris, LXVIII, 1893, 246.

6. Londe's case was that of a man 50 years old, who died suddenly of hæmatemesis. The autopsy revealed a fistula in the anterior surface of the œsophagus immediately below the bifurcation of the trachea, still filled with blood and leading into a small tuberculous cavity which had developed in a caseous bronchial lymph gland. The starting point of the tuberculous lesions was found in a miliary tuberculosis of the pleura which, invading the thoracic glands, produced caseation and calcification, and later adhesion between the affected bronchial glands and the œsophagus, with ultimate perforation of the latter.

7. Letulle states that his first case was very similar to that of Londe and omits in his publication all details.

8. His second case occurred in a young man, the subject of a tuberculous empyema which had ruptured into the œsophagus. On microscopic examination the œsophagus showed infiltration of the muscular and submucous coats with embryonic cells, little caseation and no giant cells. Tubercle bacilli were not found.*

K. Zenker† adds four cases, of which two belong to the present class.

9. In the first case the tuberculous lesion of the œsophagus occurring in a young consumptive was accidentally discovered at autopsy. The tuberculosis originated in the lungs, spread to the bronchial lymph glands, the peri-glandular tissue, and the œsophagus, infiltrating the walls of the latter from without inward until ulceration and perforation were produced. The microscopic examination showed tubercles in the muscular and submucous coats chiefly, and numerous tubercle bacilli.

10. Zenker's second case was a man 46 years old who had tuberculosis of the serous membranes. The bronchial glands were considerably enlarged and caseous, and had ulcerated into the œsophagus at its mid-portion in three places. The histological examination of the œsophagus showed tuberculous infiltration of the muscularis and submucosa, while the epithelium was scarcely affected. In the neighborhood of the ulcers, tubercles were found in the submucosa. These contained tubercle bacilli.

11. A case reported by Danel‡ also belongs to this group. There were tubercle nodules in both lungs, general glandular enlargement, and tubercles, some of which had ulcerated in the mucosa of the pharynx. The œsophagus in its posterior portion showed an extensive ulceration of the mucosa. The ulcer was about 10 cm. long and extended longitudinally. Its edges were eroded and it contained granules resembling tubercles. Other nodules taken to be tubercles were found on the anterior surface. The cause of the infection of the œsophagus was a softened bronchial lymphatic gland situated at about the bifurcation of the trachea, which, having become adherent to the œsophagus, perforated into this organ. The opening between the gland and the œsophagus measured about 1 cm. Although no histological or bacteriological examination was made, there can be no doubt of the specific nature of this case.

Of the nine cases added by Mazzotti to the three previously reported by him only one belongs to the present group. He confirmed his diagnosis of tuberculosis in each case by the demonstration of tubercle bacilli. His experience is remarkable, not only because of the large collection of cases of a pathological condition, the rarity of which is generally acknowledged, but also because of the predominance among them of that form of lesion which is admitted to be most infrequent. In eight of his cases the process began within the œsophagus, while, as stated, in one only there was an extension inward from caseous bronchial glands.

12. This case was that of a man aged 21 years, who died of pulmonary and intestinal tuberculosis. The œsophagus at the union of the upper with the middle third showed two ulcers, one near the other, somewhat elongated and of the size of a *centesimo*. The edges of the ulcers were smooth and of a greenish color; the irregular bases were also green. The ulcers perforated all the coats of the œsophagus, and their bases were formed by a collection of detritus situated under the œsophagus itself, and found to proceed from softened caseous bronchial glands. Two similar ulcers, also close together, communicating with each other beneath the mucosa, were seen at the junction of the middle and lower thirds of the œsophagus; while yet below, were small superficial elliptical ulcers in the longitudinal direction of the canal. The lymph glands had also ulcerated into the left bronchus just at its origin from the trachea.

13. A case arising through continuity of structure is reported briefly by Birch-Hirschfeld.* At the autopsy (sex and age not given) there were found tuberculosis of the lungs and numerous tuberculous ulcers in the larynx, pharynx and upper third of the œsophagus. Tubercle bacilli were demonstrated.

B.—Predisposition to Infection due to a Previous Lesion.

1. K. Zenker's third case was an example of coincident carcinoma and tuberculosis of the œsophagus. A stricture of the tube, produced by a girdle ulcer of rodent character, existed, which on microscopic examination showed the typical appearance of squamous epithelioma. This growth invaded the deeper strata of the mucosa and at times penetrated the muscularis. In the border of the cancerous portion, toward the normal tissue, typical tubercles existed, some of which were caseous. The neighboring lymph glands also were involved in the cancerous and tuberculous conditions. Tubercle bacilli were found in small number in the tubercles.

Zenker does not commit himself as to whether the carcino-

*The validity of this case may well be questioned. Mixed infections in empyema are by no means unknown, so that the possibility of the invasion of the œsophagus by other micro-organisms (pyogenic cocci?) is well worth considering.

†K. Zenker: Carcinom und Tuberkel in selben Organe. Deut. Arch. f. klin. Med., XLVII, 1891, 191; Beitrag zur Aetiologie und Casuistik der Tuberculose der Speiseröhre. Deut. Arch. f. klin. Med., LV, 1895, 405.

‡Danel: Œsophagite tuberculeuse consécutive à une ancienne tuberculose peri-bronchique généralisation ganglionnaire. J. d. Sc. méd. de Lille, XIX, 1896, 1, 520.

*Birch-Hirschfeld: Lehrbuch der path. Anat., II, 1894, 620.

matous or tuberculous lesion was primary, but favors the former view because of the admitted resistance offered by the intact epithelium to tuberculous infection.

2. In this group of cases the one reported by Cordua* is to be placed.

A man 60 years of age came to autopsy, the clinical diagnosis of carcinoma of the œsophagus, incipient pulmonary tuberculosis, and adhesive pleuritis having been made. In the œsophagus, at about the bifurcation of the trachea, was found an ulcer 10 to 15 cm. long, which affected this structure in its entire circumference. The edges of the ulcer were somewhat elevated and firm; the base was very soft and pulpy. A sound could be passed from the middle of the ulcer far into the perioesophageal tissues, but not into the air passages. Upon sectioning the ulcer, the entire wall of the œsophagus was found to be almost destroyed, forming a small tumor mass. The microscopic examination showed, in addition to the carcinomatous, a tuberculous infection. Tubercles in process of caseation were found in the middle of the cancerous ulcer and about its periphery. Careful search failed to reveal tubercle bacilli.

Cordua favors the view that the tuberculous invasion of the cancerous ulcer took place through the lymphatics leading from tuberculous areas in the lungs; and he assigns as reasons for his belief in this mode of infection, the absence of cancerous metastases and the presence of coal pigment in the lymph glands, the deep location of the older tubercles in the cancerous ulcer, and the more superficial situation of the younger ones. It would seem, however, more probable that the secondary tuberculous infection was due to sputum deglutition.

3. Pepper and Edsall† report the case of a man, 42 years of age, who had tuberculosis of the lungs, larynx, cervical glands and œsophagus. The œsophagus was patulous and normal as high up as the level of the arch of the aorta. Above this point and to the junction with the pharynx, the lumen had entirely disappeared. The œsophageal walls and surrounding tissues had formed a band of dense fibrous tissue, about 1.25 cm. thick and 3.75 cm. broad, which was firmly bound to the vertebræ. Sections of the growth examined microscopically showed cancerous tissue in a dense fibrous tissue basis, tubercle-like masses undergoing fibroid change, an occasional giant cell, and tubercle bacilli.

The central and deeper portions of the tumor were composed mainly of fibrous tissue, and this appearance led the authors to conclude that tuberculosis was evidently the original cause of the disease, while cancer subsequently infiltrated the occlusion. (?) That the cancer was primary they consider improbable, both from the microscopic appearance of "infiltration of a previously existing mass, and from the history of cancer being here as elsewhere one of inexorable growth and onward progress, ulceration, and sloughing."

*Cordua: Ein Fall von krebsig-tuberculosem Geschwür des Oesophagus. Arbeiten a. d. pathologischen Institut in Göttingen, 1893, 147.

†Pepper and Edsall: Tuberculous occlusion of the œsophagus with partial cancerous infiltration. Amer. Jour. of the Med. Sci., CXIV, 1897, 44.

C.—INFECTION OF THE INTACT MEMBRANE DIRECTLY (BY SPUTA) OR FROM THE CIRCULATING BLOOD.

This class embraces those lesions which heretofore were regarded as most unusual, but which from Mazzotti's experience must rank in frequency with those described in class I. The eight cases of Mazzotti belonging to this group would seem for the most part to have been caused by the deglutition of tuberculous sputum, though the coexistence of ulcers and nodules makes it difficult in some instances to differentiate certainly the inoculation of tuberculous sputum from infection through the blood.

1. The first case reported by Mazzotti was a woman, aged 33 years, who died of pulmonary and œsophageal tuberculosis. At autopsy the mucosa of the œsophagus, normal in its upper part, was found reddened below. The redness increased in intensity from above downward, becoming scarlet near the cardiac orifice of the stomach. On this red base were scattered numerous tuberculous ulcers. These were small and superficial in the upper segment, measuring several millimetres in diameter, becoming larger lower down, until near the cardiac orifice of the stomach several of them coalesced, forming an extensive loss of substance. The large ulcer thus produced was more irregular and deeper than the others, extending indeed to the muscular tunic.

2. The second occurred in a man, aged 40 years, who died of pulmonary phthisis. The œsophagus presented above, and in the anterior wall at its junction with the larynx, several white, rounded prominences, slightly larger than the head of a pin, with ulcerated centres. A little lower down there was an elliptical longitudinal ulcer with smooth base and slightly elevated edge, 5 cm. in circumference. Lower still, and rather near the end of the œsophagus, a yellowish nodule projected from the mucosa. This had ulcerated, and in all respects resembled the elliptical ulcer described. The mucous membrane in general was pale, but near the stomach there was some injection without ulceration.

3. The third case was a woman, aged 35 years, who had died of pulmonary tuberculosis. The œsophagus was normal in its upper part. At about the middle third the mucosa was of a greyish black color and contained several superficial ulcers with smooth margins and regular white bases. They were elliptical in the longitudinal direction. In the lower third the mucosa was pale, but here, too, were elliptical ulcers, smaller than the former, which they resembled in every other particular. The deepest of these ulcers scarcely reached the muscular coat.

4. The fourth was a man, aged 60 years, who succumbed to pulmonary and intestinal tuberculosis. The mucosa of the œsophagus in its lower half contained about 30 elliptical ulcers with smooth, regular margins and bases. They were smaller and more superficial above, but on descending the canal approached each other more closely, became larger and deeper, extending finally to the submucosa.

5. The fifth example was furnished by a male, aged 18 years, who died of pulmonary phthisis. Throughout the œsophagus were scattered numerous ulcers. They were elliptical in form, the larger ones being relatively longer than the smaller. In

some places several ulcers were united in such a way as to present an irregular shape. In other places the ulcers were separated by little tracts of healthy mucosa, giving the appearance of a network. They were not very deep, touching at most the submucous tissue, and had greyish bases and smooth, regular, slightly elevated edges.

6. The sixth was a man, aged 67 years, in whom pulmonary and intestinal tuberculosis were also found. In the œsophagus, three inches from its origin, was an ulcer of the mucosa 5 cm. in length. Near this were two small ulcers, while a little below was one of intermediate size. The remainder of the mucosa contained only smooth white elevations about the size of a pin-head. At the junction of the middle and lower third of the œsophagus, was a diverticulum as large as the end of the little finger.

7. The seventh was a woman, aged 48 years, who presented the lesions of pulmonary and intestinal tuberculosis. In the lower two-thirds of the œsophagus the mucosa attracted attention by an intense redness which extended over a wide area. In the midst of this were twelve or fifteen ulcers of various sizes. The smaller ones were round, measuring 0.5 cm. in diameter; the larger were elongated, the diameter of the largest reaching more than 3 cm. The rest were all regular, with smooth superficial margins, except a single deeper one situated at the union of the middle and lower thirds.

8. Mazzotti's final case was a man, aged 61 years, who succumbed to pulmonary phthisis. The œsophagus in its upper part presented four or five scars several millimetres in length, with ulcerated centres, in the vicinity of which the mucosa was pale, but otherwise of normal appearance.

9. Zenker's fourth case belongs to this class. It occurred in a man 38 years old, who suffered from tuberculosis of the lungs, nose and throat, enlarged lymphatic glands, and stenosis of the œsophagus. At the autopsy, the œsophagus in its uppermost part presented a large superficial scar-like ulcer which included almost the entire circumference of the canal, and formed a marked constriction. At about its middle portion the œsophagus showed an elevated nodule the size of a bean, from which thin pus escaped. The bronchial and peri-œsophageal lymph glands were enlarged and caseous. The microscopic examination of the lesions in the œsophagus exhibited the histological characters of tuberculosis, which was limited to the mucosa and submucosa. Numerous tubercle bacilli were demonstrated in the tubercles and pus.

Zenker* believes that the infection in this case was due to sputum deglutition, and brings forward the fact of the superficial character of the ulcers in support of this view.

10. Hasselmann† describes the case of a boy six months old, in whom, in addition to tuberculosis of the œsophagus, there existed tuberculosis of the lungs and lymph glands. In the lower part of the œsophagus three crater-like ulcers were found which had no connection with either the trachea or the caseous lymph glands. The microscopic examination proved them to be tuberculous in nature. The infection is believed to have taken place from the swallowed sputum.

11. The case reported by E. Fränkel* occurred in a man 33 years of age, who died of pulmonary and intestinal tuberculosis. The œsophagus contained a large number of yellowish spherical nodules about the size of a hemp seed, some with superficial loss of substance, others still covered with the intact mucosa. Adjacent to these were found small masses with irregular edges and uneven bases, and several small round ulcers with abrupt edges and perfectly smooth bases, averaging 3 mm. in diameter. The larynx, trachea and peritracheal lymph glands were quite intact. The microscopic examination of the lesions showed besides epithelioid and giant cells, tubercle bacilli.

Regarding the mode of infection in this case, Fränkel does not consider it possible to conclude certainly between a hæmatogenous origin and the inoculation of tuberculous sputum, but he inclines to the latter view.

12. Glockner† describes a case which he regards as of hæmatogenous origin, and which is peculiar in the limitation of the tubercles to the muscular coat of the œsophagus.

It occurred in a man, 48 years of age, in whom the autopsy showed old tuberculous areas in the apices of both lungs, tuberculosis of the pleura, peribronchial and mesenteric lymph glands, œsophagus and viscera generally. The œsophagus at its mid-portion contained an irregular thickened zone, encircling the wall of the tube, 5 cm. in width, and from 5 to 7 mm. in thickness. On section of this thickened area it was found to consist of numerous caseous tubercles, varying in size from a pin-head to a hemp seed, irregularly infiltrating the muscular coat, to which they were strictly limited. The mucosa and submucosa were perfectly intact and freely movable over the deeper lying structures. The peri-œsophageal tissue was likewise free from diffuse infiltration, but contained several small strands with interrupted nodular swellings the size of a millet seed. These strands were interpreted by Glockner as tubercle-infiltrated afferent vessels of lymph glands. The lymph glands in the neighborhood of the thickening, as well as those about 3 cm. above, were somewhat enlarged and caseous, but not abnormally adherent to the peri-œsophageal tissue. Microscopic examination showed the typical structure of caseous tubercles, and tubercle bacilli in great numbers were found.

Glockner regards this case as certainly of hæmatogenous origin and believes that he excludes all other modes of infection. Infection through continuity he eliminates by the absence of lesions in the continuous structures; direct inoculation of the inner surface of the mucous membrane is rendered improbable by the intact condition of both mucosa and submucosa; invasion from the peribronchial lymphatic glands, through lymph transport of tubercle bacilli, he excludes by the freedom from tuberculous infiltration of the peri-œsophageal tissue. In favor of hæmatogenous infection

* Zenker: Op. cit.

† Hasselmann: Ueber Tuberculose des Oesophagus. Inaug.-Dissertation, München, 1895.

* E. Fränkel: Ueber seltene Localisation der Tuberculose. Münch. med. Wochenschr., XLIII, 1896, 27.

† Glockner: Ueber eine neue Form von Oesophagus-Tuberculose. Prag. med. Woch XXI, 1896, 114, 127, 138.

Section of the œsophagus showing discrete tubercles composed of epithelioid and giant cells in a lymph-node extending into the mucosa. Hæmatoxylin staining. Zeiss objective DD, eye-piece No. 1.

is adduced not only the peculiar localization of tubercles in the muscular coat of the œsophagus, but also the dissemination of miliary tubercles in the viscera generally.

To this last series of cases may be added the one from this laboratory. It occurred in a colored man, aged 33 years, admitted to the surgical wards of the Johns Hopkins Hospital, service of Dr. Halsted, to whom we are indebted for the clinical notes. The history, however, has but little bearing upon the lesions in the œsophagus, and may therefore be briefly stated.

Clinical History. The first admission to the hospital was on September 16th, 1895, for an enlarged right testicle. There was a tuberculous family history. The patient had previously suffered from typhoid fever, gonorrhœa and syphilis, and for the past four years had been short of breath. His general health, however, had been good until a few months before admission. The examination showed, besides tuberculosis of the right testicle, a slight involvement of the right lung at the apex, and a dark and mottled condition of the mucous membrane of the mouth. The right testicle was removed, the wound healed promptly, and the patient was discharged from the hospital, October 22nd, 1895.

On February 7th, 1897, he returned to the hospital suffering with tuberculosis of the left testicle and cough. He failed rapidly and died March 1st, 1897.

The autopsy was performed by Dr. Flexner four hours after death. I shall abstract the protocol and give only the anatomical diagnosis and such notes as bear upon the lesions in the œsophagus.

Anatomical Diagnosis. Removal of testicle (for tuberculosis) eighteen months previously; tuberculosis of epididymis and remaining testicle, seminal vesicles and prostate gland; generalized tuberculosis; chronic tuberculosis of lungs; peculiar nodular form of tuberculosis of spleen and kidneys; tuberculosis of adrenal glands; Addison's disease; pigmentation of mucous membrane of mouth.

The œsophagus shows in its lower two-thirds elevated dots and larger nodules in great numbers. None of these are caseous, but the smaller points resemble the individual tubercles found in the spleen, liver and other glands.

The tubercles in these organs are minute granulomata, submiliary in size, of pale grayish-white color, opaque and non-caseating.

Histological Examination. The elevated dots and nodules found in the lower two-thirds of the œsophagus are seen to be enlarged lymphoid follicles, invaded by miliary tubercles which at times become conglomerated. A section of one of the larger oval nodules, measuring 1.25x1.50 mm., contains nine small, pale, irregularly circular areas of different sizes, with more or less definite contours, arranged in horse-shoe fashion around the periphery of the nodule. These pale areas contrast sharply with the more deeply-stained normal lymphoid structure.

Under somewhat greater magnification the pale areas are seen to consist of epithelioid cells, at times distinctly separated one from the other by irregular spaces in which are found sparsely scattered lymphoid cells. A scant reticulum holds these elements loosely together. The epithelioid cells are round or oval, with abundant protoplasm and vesicular nuclei. The nuclei are round, oval, elongated or kidney-shaped. Some of these cells contain two or more nuclei, and occasionally is seen a well-defined giant cell with a mural arrangement of its nuclei. The epithelioid clumps are surrounded by lymphoid cells, but these cannot be differentiated from the normal structure of the lymphoid nodule. At other levels the nodule shows partial coalescence of the discrete tubercles, thus giving an appearance of more diffuse infiltration.

Other nodules examined show an appearance similar to that just described; while the smaller dots, at times of microscopic size, often contain a single cellular tubercle.

Tubercle bacilli are present in small number.

Nowhere are the tubercles found outside the lymphoid nodules, and in no instance do they extend beneath the mucosa. The œsophagus is otherwise normal.

The mode of infection in this case offers no difficulties; it is clearly of hæmatogenous origin, the original focus being the diseased testicle. The case forms, together with the one instance of miliary tuberculosis of Mazzotti, excluding for the time the less certain cases of E. Fränkel and Glockner, the instances of undoubted blood infection of the œsophagus.

No other instance of the localization of the tuberculous lesions in the lymphoid structures of the œsophagus has thus far been published. According to Dürck* the relative insusceptibility of the œsophagus to tuberculosis depends in part upon the slight development of its lymphatic apparatus. There is, however, no great dearth of small nodular accumulations of lymphoid cells in the submucosa and mucous membrane of this organ, which may after all be oftener the seat of tubercles than is generally considered. The insignificance of these structures, even when, as in this case, they are involved in a general tuberculosis, may easily lead to their being overlooked. Without the microscopical examination of many different segments in a given case, the disease could readily escape observation.

The relative immunity of the œsophagus from other forms of tuberculosis, especially from those varieties included under classes II and III, may be explained in part upon purely mechanical grounds; namely, the rapid passage of infectious material over the mucous membrane of the œsophagus, and the resistance to such infection offered by the stratified pavement epithelium.

A review of the entire subject tends, however, to modify considerably the opinion once held that tuberculosis of the œsophagus arises in a large majority of cases through continuity or contiguity of structure. Thus, of the total forty-eight cases collected, only twenty-four took origin in this way, five arose through the addition of the tuberculous process to a previous predisposing lesion, four by blood infection, while the remaining fifteen arose through the inoculation of the mucous membrane by tuberculous sputum, without the existence of a previous demonstrable lesion.

The study of this subject was undertaken at the suggestion of Dr. Flexner, to whom the writer is indebted for kind assistance in the preparation of these notes.

* Dürck: Ueber Tuberculose des Oesophagus. Ergebnisse der Pathologie, I, 1897.

A RARE ANOMALY OF THE ARCH OF THE AORTA, WITH AN ADDITIONAL MUSCLE IN THE NECK.

By A. B. Herrick.

The variation herewith reported is from the cadaver of a negro dissected in the Anatomical Laboratory of the Johns Hopkins University. With the exception of the supernumerary muscle, the variation can easily be explained by an arrest of the development of the aortic arches, showing also that in these cases the inferior laryngeal nerve is no longer held down by the fifth aortic arch and drawn into the chest.

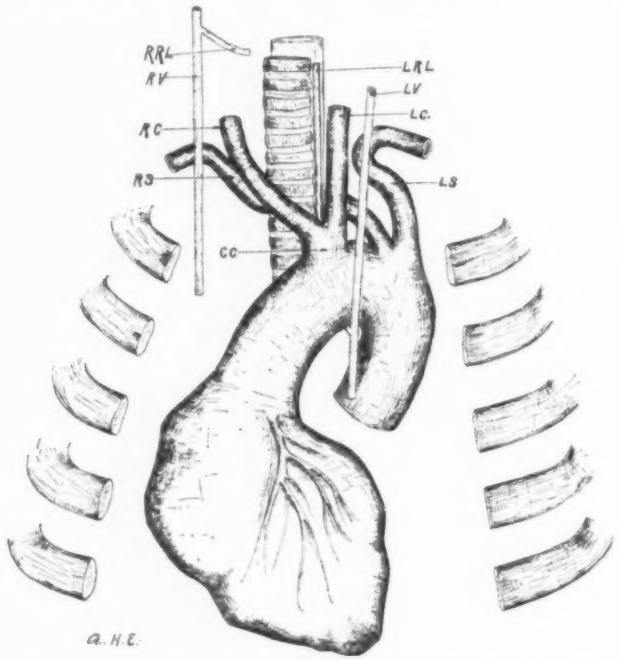

Fig. 1. The aortic arch and its branches, showing their relations to the trachea and œsophagus, and the position of the recurrent laryngeal nerves.

CC, common trunk of the two carotids; *RS*, right subclavian; *LS*, left subclavian; *RC*, right carotid; *LC*, left carotid; *RV*, right vagus; *LV*, left vagus; *RRL*, right recurrent laryngeal; *LRL*, left recurrent laryngeal.

The number of arteries arising from the arch was normal, but their arrangement was unusual; the two carotids arising nearest the heart by a common trunk, then the left subclavian, and lastly the right subclavian passing behind the trachea and œsophagus. The common trunk of the two carotids is about 10 mm. in length and arises from the beginning of the transverse arch. The left carotid passes vertically upward, while the right passes transversely in front of the trachea, and at its right border turns upward to take its usual position. The left subclavian takes its origin from the highest part of the arch and follows the usual course. The right subclavian, however, arises just behind and to the right of the left, and almost immediately passes transversely behind the œsophagus to the right side of the body. It extends beyond the œsophagus for about 8 mm., then turns upward 25 mm., and passes outward behind the scalenus anticus, reaching a point a little higher than normal, after which it continues downward in its usual course. The accompanying figure gives the origin and relation of the blood-vessels to one another. The vertebral arteries arise as usual.

The inferior laryngeal nerve on the left side arises from the vagus in the usual way, while on the right side it is not hooked around the subclavian, but passes directly from the vagus to the larynx in the neighborhood of the lower border of the cricoid cartilage.

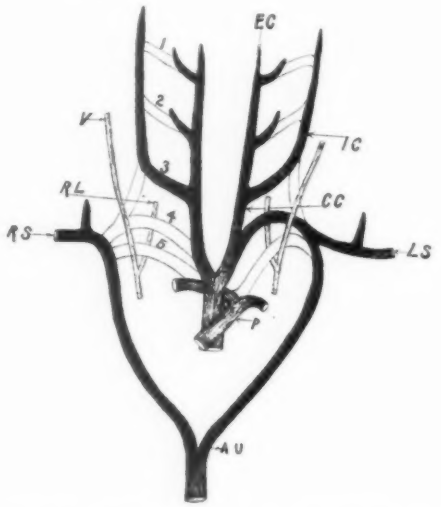

Fig. 2. Diagram showing the mode of development of the great arteries in this anomaly. (Modified from Quain's Anatomy.)

AU, union of aortæ; *RS*, right subclavian; *LS*, left subclavian; *CC*, common carotid; *IC*, internal carotid; *EC*, external carotid; *P*, pulmonary trunk; *V*, vagus; *RL*, recurrent laryngeal; 1, 2, 3, 4, 5, aortic arches.

The origin of this anomaly is easily understood when the development of the aortic arches is taken into consideration. The scheme of the development of the aortic arches is shown in Fig. 2. As the successive bronchial arches are developed they receive within them, passing from their ventral to their dorsal side, the aortic arches. These encircle the pharynx and are collected into two descending aortæ, which later on unite. The point of union is represented in the figure at *AU*. Hand in hand with the development of the aortic arches, the ganglia of the nerves arise from the neural crest and at first lie lateral to the arteries. A twig from the vagus passes over to the pharynx behind the fourth branchial arch, and crosses the fifth aortic arch at right angles. The descent of the vessels into the chest throws the vagus on the ventral side of the aortic arches, and the twig to the pharynx being caught by

the arch, becomes elongated to form the inferior laryngeal nerve.

In the diagram that portion of the arches which is to remain to form an anomaly such as this is printed black, while the vessels which are to disappear are only outlined. Through some mishap the fourth arch on the right side degenerated, thus liberating the inferior laryngeal nerve, while the circulation with the right arm was continued through the descending aorta of that side. By the later enlargement of these vessels the origin of the right subclavian was next shifted over to the left side of the body, thus making it arise immediately below the left subclavian from the arch of the aorta.

This variation has already been described by a number of authors,* but in this specimen the presence of an additional muscle within the neck adds interest to it and may possibly be the cause of this rare anomaly.

The anomalous muscle.—This muscle was present on the right side of the neck, as a thin, narrow, ribbon-like body, five centimetres in length, and in appearance resembled the anterior belly of the omohyoid muscle, as Fig. 3 shows. It arises from the anterior tubercle of the transverse process of the fifth cervical vertebra, and is inserted by an expanded aponeurosis into the posterior border of the clavicle. This expansion greatly resembles a fibrous arch, being easily detached from the bone at its center, but is firmly adherent at each lateral margin, which corresponds with the junction of the middle with the outer and the inner thirds of the clavicle.

Henle† considers this muscle as a variation of the omohyoid, regarding those specimens where either the anterior or posterior belly of the muscle is inserted into the clavicle as a transition stage between the normal, and this rarer anomaly. This muscle may take its origin from any or from all of the middle cervical vertebræ.

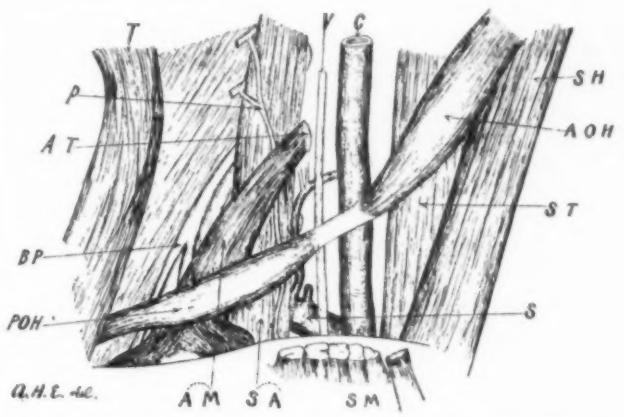

FIG. 3. The position and relations of the supernumerary muscle in the neck.

AM, additional muscle; *SA*, scalenus anticus; *SM*, sterno-mastoid; *ST*, sterno-thyroid; *SH*, sterno-hyoid; *AOH*, anterior belly of the omohyoid; *POH*, posterior belly of the omohyoid; *T*, trapezius; *V*, vagus; *P*, phrenic; *BP*, brachial plexus; *S*, subclavian; *C*, carotid; *AT*, anterior tubercle of the fifth cervical vertebra.

If it is true that the muscles in their development shift their position so that their attachment in the adult is only secondary, then we can see in this muscle a summation of the additional attachments of the two ends of the omohyoid. In one instance the posterior belly arises altogether or by an additional slip from the clavicle; in the other instance the anterior belly is inserted, by an additional slip, to the transverse process of a cervical vertebra. In the specimen reported these two variations are blended into a new muscle, and the omohyoid remains normal.

* Meckel, Pathologische Anatomie; Henle, Handbuch der Anatomie; and Quain, Commentaries on the Arteries.

† Henle, Anatomie, III, S. 121.

ON THE HÆMATOZOAN INFECTIONS OF BIRDS.

BY W. G. MACCALLUM, M. D. (Johns Hopkins), *Johns Hopkins Hospital, Baltimore.*

In the adult examples of the Halteridium of Labbé, which occurs abundantly in crows in Ontario, Opie in 1896–7 pointed out a distinction between two forms—a hyaline, non-staining form, and a form which is granular and takes on a comparatively dark stain with methylene blue—and suggested that the hyaline form alone might become flagellated. This distinction is readily confirmed, and it is a fact that only the hyaline forms become flagellated, the granular forms being extruded, and lying quiet as spheres beside the free nuclei of the red corpuscles which lately contained them.

Motile fusiform bodies, identical with the "Vermiculus" described by Danilewsky in his "Parasitologie comparée du Sang," in 1889, are seen after fifteen or twenty-five minutes to develop from these quiet spheres and wander away. By careful watching of the two adult forms on extrusion from the corpuscle, it is seen that the flagella from the flagellated forms, tearing themselves free, constitute themselves fertilizing agents or spermatozoa, and proceeding directly to the granular sphere, wriggle about it. One only of these gains admission, and plunges itself into the sphere, which after some agitation of the pigment becomes quiet for a period of fifteen or twenty-five minutes, after which it puts out a conical process, which grows and draws the protoplasm into itself, until we finally have the fusiform body with a small pigmented appendage and refractive, nucleus-like body such as was described by Danilewsky as a "Vermiculus." The origin of the vermiculus is in every case exactly the same.

In other words, we have a sexual process with a resulting motile form, occurring under unfavorable circumstances, and comparable with analogous processes observed in the lower plants and animals.

It is thought that a similar process may be expected in the case of the human malaria.

The vermiculus moves actively and has great powers of penetration by means of its pointed anterior end, with which it breaks up the red corpuscles in its path, and it is thought that possibly it may penetrate the intestinal wall and escape as the resistant form which gains the external world. This idea is supported by the finding of free organisms in the mucous contents of the intestine.

In the organs, the connective tissue skeleton is one great storehouse of pigment, the branching cells being often loaded with foreign material. The endothelial cells are also very generally pigmented, and there occur in some of the organs, as well as in their blood-vessels, large makrophages loaded with pigment and other debris. Many large phagocytic cells occur in various organs which engulf whole corpuscles with their contained organisms.

The organs found pigmented are, in the order of intensity of pigmentation, the spleen, liver, bone-marrow, intestine, kidney, adrenals and thyroid. The leucocytes take but little part in phagocytosis in the organs, although phagocytosis goes on actively in a slide of blood.

During the last week I have examined the blood of a woman suffering from an infection with the æstivo-autumnal type of organism, in which a great number of crescents were to be seen. These in a freshly made slide of blood, with very few exceptions, retained their crescentic shape for only a few minutes. They soon drew themselves up, thus straightening out the curve of the crescent while shortening themselves into the well-known ovoid form. After the lapse of 10 to 12 minutes most of them were quite round and extra-corpuscular, the "bib" lying beside them as a delicate circle or "shadow" of the red corpuscle.

After 20 to 25 minutes certain ones of these spherical forms became flagellated; others, and especially those in which the pigment formed a definite ring and was not diffused throughout the organism, remained quiet and did not become flagellated. In a field where an example of each form could be watched, the flagella broke from the flagellated form and struggled about among the corpuscles, finally approaching the quiet spherical form; one of them entered, agitating the pigment greatly, sometimes spinning the ring about. The rest were refused admission, but swarmed about, beating their heads against the wall of the organism. This occurred after 35 to 45 minutes.

After the entrance of the flagellum the organism again became quiet and rather swollen, but although in the two instances in which this process was traced the fertilized form was watched for a long time, no form analogous to the "vermiculus" was seen.

This is evidently for the human being what was foreshadowed by the organisms of the bird.

(In part an abstract of a paper read before the British Association for the Advancement of Science, August 24, 1897, and shortly to appear, *in extenso*, in the Journal of Experimental Medicine.)

A CASE OF CAVERNOUS ANGIOMA (VASCULAR NÆVUS) OF THE TUNICA CONJUNCTIVA.

By Dr. H. O. Reik.

James Minor, colored, aged 16 years, came to the Baltimore Eye, Ear and Throat Hospital, March 1st, 1897, for treatment of a growth on his left eye. His mother states that very shortly after birth a small, red, raised spot, probably twice as large as a pin-head, was noticed on his left eye. This statement is confirmed by the midwife; there was no physician in attendance. For some time no change was noticed in the eye, but by the end of his first year the spot had increased some in size, and for the next five years continued to grow steadily, though not rapidly. It never seemed to give any pain nor did the tissue immediately surrounding it become inflamed at any time, so it was not considered necessary to consult a physician. The growth assumed its present size by the time he was six years old, and since then, his mother thinks, it has undergone little or no change. He consulted me simply because he desired, if possible, to have his appearance improved.

The tumor was quite noticeable even at some distance, but on close inspection, with the eye turned outward so that the cornea almost reached the outer canthus, an appearance like that seen in the accompanying reproduction was obtained. (Fig. 1.) To the nasal side and about 3 millimetres removed from cornea was a dark purplish-red tumor about 15 mm. long, 3 to 5 mm. wide and 5 mm. in thickness, narrowed somewhat toward its upper extremity, which was rounded, and extending below under the lid into the *conjunctiva fornicis inferioris*. Its anterior surface was convex, smooth and shiny, covered by conjunctiva, and two narrow, light bands of connective tissue appear to pass almost horizontally across the tumor, thus producing a slightly lobulated appearance. Its posterior surface was slightly concave and rested in its entire length upon the *bulbus oculi*. The tumor was situated entirely in the *tunica conjunctivæ bulbi*, and one or two good-sized vessels passed from it below into the *conjunctiva fornicis* after pursuing a somewhat tortuous course. By pressure the tumor could be moved very slightly from side to side, but sufficiently to indicate that it was not adherent to the sclera. The *plica semilunaris conjunctivæ* was hypertrophied, slightly congested, and, when the eye was rotated inward, presented several delicate folds.

An incision was made in the conjunctiva near the outer edge of the growth, blunt-pointed scissors were then passed beneath the tumor and it was easily lifted off its bed. No hemorrhage was encountered until the base was cut well down in the *conjunctiva fornicis*, and even then the bleeding was slight.

I saw the patient last on March 28th. The wound was perfectly healed and the eye looked normal, save that the vessels mentioned before as connected with the tumor were still present, though greatly reduced in size.

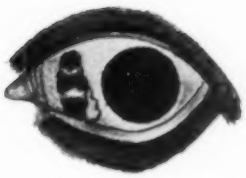

FIG. 1.

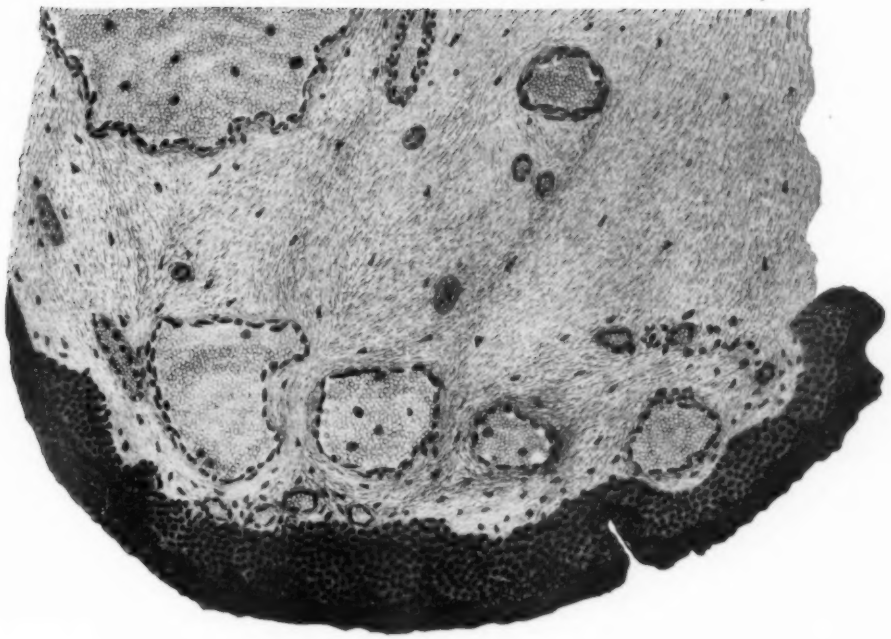

FIG. 2.

Anterior portion of Cross-Section.

The specimen was hardened in formalin and embedded in celloiden. Sections were cut in different directions through the growth and stained in hæmatoxylin and eosin, picro-carmine, methylene-blue and lithium-carmine.

Under the low power the tissue seemed to be composed of a loose connective tissue with many small areolar spaces and to contain very numerous blood-vessels. These vessels run in every direction, and within a small radius one sees various sections of them, taken in their long axis, obliquely or crosswise. In addition, in the most vascular parts of the tumor, large blood spaces are to be made out with tolerably thin walls of connective tissue, walls which in places appear to be lined by endothelium, though this is not easily made out everywhere. These cavernous spaces show thin connective tissue bands running across them, lined by endothelium, and one can think of there being partial or complete partitions separating adjacent thin-walled sinuses.

By the higher power the connective tissue is seen to consist mainly of the white fibrous variety, loosely constructed and not very rich in connective tissue corpuscles. The anterior surface of the periphery of the growth is covered by conjunctival epithelium, below which is a narrow band-like area of round cell infiltration. The endothelial cells lining the numerous small vessels are easily distinguished and the lumina of the vessels are filled with blood. The relative proportions of the different varieties of leucocytes, so far as could be judged, were not abnormal. (Fig. 2.) The tumor is then, histologically, a cavernous angioma, or it may be called if preferred, a vascular nævus.

A careful search of literature for any similar cases which might have been reported has served to show us how very rare they are. As the distinction between angioma and vascular nævus is not a very clear one, depending apparently upon the question as to whether the tumor is actively growing or is remaining stationary, it occurred to me that various writers might have made different classification, so I looked not only for reports of angioma, but of vascular nævi and telangiectasia as well. I could not believe that these growths were so extremely rare as this search would make it appear. So far as I am aware only one case has heretofore been reported in this country, that of Lippincott, and I have been able to find only two others in the English language, both by Dr. Simeon Snell, of London. One of Snell's reports is accompanied by a colored plate, and the shape, size and position of the tumor give it a strong resemblance to my own. No microscopical examination of either of his cases is mentioned. Lippincott's* specimen was examined by Prof. Whitney, of Harvard, and is described as a cavernous angioma. Rampoldi and Stefanini,† Armaignac,‡ Dubois,§ Talko,‖ Van Ammon and Blessig¶ have each described or mentioned one or two cases. Bossalino and Hallaner,* Reich† and Kroschinski‡ have each reported a single case accompanied by histological reports, and their findings are essentially similar to those described in the present case.

Fuchs in his treatise on diseases of the eye says "Angiomata of the conjunctiva are of rare occurrence. They are as a rule congenital and increase in size after birth."

Noyes says that "Angioma of the conjunctiva sometimes occurs. Its most frequent seat is the caruncle." Neither of these authors mentions nævi of the *tunica conjunctivæ bulbi*.

"Angioma of the conjunctiva," says Saemisch, "either spread there from a palpebral tumor or develop primarily in that membrane. They are mostly congenital and occur as a rule in the neighborhood of the inner commissure, or, exactly, on the *plica semi-lunaris conjunctivæ*." He advises their removal, "because after remaining unchanged for some years, they gradually increase in circumference, and through narrowing of the conjunctival sac, and later by projection from the palpebral fissure, become quite troublesome."

These tumors developing primarily in the conjunctiva, according to Virchow, "are very rare and seldom progress beyond the nævus stage, although an occasional observation of more extensive growth is known."

* Trs. Am. Oph. Soc., vol. 7, p. 372.
† Ann. di Ottal., Pavia, 1884, vol. XIII, p. 75.
‡ Rev. Clin. d'Ocul., Paris, 1886, vol. VI, p. 73.
§ Anal. d'Ocul., Brux., 1855, vol. XXXIV, p. 267.
‖ Klin. Monats. f. Augenh., Erlangen, 1873, vol. XI, p. 335.
¶ Græfe und Sæmisch Handbuch, vol. IV.

* Archiv f. Ophthalmologie, Leipz., 1895, vol. XLI, p. 186.
† Centralbl. f. prakt. Augenheilk., Leipz., 1877, vol. I, p. 176.
‡ Beiträge zur Augenheilkunde, June, 1894.

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HARVEY W. CUSHING, M. D., Assistant in Surgery.
J. M. LAZEAR, M. D., Assistant in Clinical Microscopy.
J. L. WALZ, Ph. G., Assistant in Pharmacy.

GENERAL STATEMENT.

The Medical Department of the Johns Hopkins University was opened for the instruction of students October, 1893. This School of Medicine is an integral and coördinate part of the Johns Hopkins University, and it also derives great advantages from its close affiliation with the Johns Hopkins Hospital.

The required period of study for the degree of Doctor of Medicine is four years. The academic year begins on the first of October and ends the middle of June, with short recesses at Christmas and Easter.

Men and women are admitted upon the same terms.

In the methods of instruction especial emphasis is laid upon practical work in the Laboratories and in the Dispensary and Wards of the Hospital. While the aim of the School is primarily to train practitioners of medicine and surgery, it is recognized that the medical art should rest upon a suitable preliminary education and upon thorough training in the medical sciences. The first two years of the course are devoted mainly to practical work, combined with demonstrations, recitations and, when deemed necessary, lectures, in the Laboratories of Anatomy, Physiology, Physiological Chemistry, Pharmacology and Toxicology, Pathology and Bacteriology. During the last two years the student is given abundant opportunity for the personal study of cases of disease, his time being spent largely in the Hospital Wards and Dispensary and in the Clinical Laboratories. Especially advantageous for thorough clinical training are the arrangements by which the students, divided into groups, engage in practical work in the Dispensary, and throughout the fourth year serve as clinical clerks and surgical dressers in the wards of the Hospital.

REQUIREMENTS FOR ADMISSION.

As candidates for the degree of Doctor of Medicine the school receives:

1. Those who have satisfactorily completed the Chemical-Biological course which leads to the A. B. degree in this university.

2. Graduates of approved colleges or scientific schools who can furnish evidence: (*a*) That they have acquaintance with Latin and a good reading knowledge of French and German; (*b*) That they have such knowledge of physics, chemistry, and biology as is imparted by the regular minor courses given in these subjects in this university.

The phrase "a minor course," as here employed, means a course that requires a year for its completion. In physics, four class-room exercises and three hours a week in the laboratory are required; in chemistry and biology, four class-room exercises and five hours a week in the laboratory in each subject.

3. Those who give evidence by examination that they possess the general education implied by a degree in arts or in science from an approved college or scientific school, and the knowledge of French, German, Latin, physics, chemistry, and biology above indicated.

Applicants for admission will receive blanks to be filled out relating to their previous courses of study.

They are required to furnish certificates from officers of the colleges or scientific schools where they have studied, as to the courses pursued in physics, chemistry, and biology. If such certificates are satisfactory, no examination in these subjects will be required from those who possess a degree in arts or science from an approved college or scientific school.

Candidates who have not received a degree in arts or in science from an approved college or scientific school, will be required (1) to pass, at the beginning of the session in October, the matriculation examination for admission to the collegiate department of the Johns Hopkins University, (2) then to pass examinations equivalent to those taken by students completing the Chemical-Biological course which leads to the A. B. degree in this University, and (3) to furnish satisfactory certificates that they have had the requisite laboratory training as specified above. It is expected that only in very rare instances will applicants who do not possess a degree in arts or science be able to meet these requirements for admission.

Hearers and special workers, not candidates for a degree, will be received at the discretion of the Faculty.

ADMISSION TO ADVANCED STANDING.

Applicants for admission to advanced standing must furnish evidence (1) that the foregoing terms of admission as regards preliminary training have been fulfilled, (2) that courses equivalent in kind and amount to those given here, preceding that year of the course for admission to which application is made, have been satisfactorily completed, and (3) must pass examinations at the beginning of the session in October in all the subjects that have been already pursued by the class to which admission is sought. Certificates of standing elsewhere cannot be accepted in place of these examinations.

SPECIAL COURSES FOR GRADUATES IN MEDICINE.

Since the opening of the Johns Hopkins Hospital in 1889, courses of instruction have been offered to graduates in medicine. The attendance upon these courses has steadily increased with each succeeding year and indicates gratifying appreciation of the special advantages here afforded. With the completed organization of the Medical School, it was found necessary to give the courses intended especially for physicians at a later period of the academic year than that hitherto selected. It is, however, believed that the period now chosen for this purpose is more convenient for the majority of those desiring to take the courses than the former one. The special courses of instruction for graduates in medicine are now given annually during the months of May and June. During April there is a preliminary course in Normal Histology. These courses are in Pathology, Bacteriology, Clinical Microscopy, General Medicine, Surgery, Gynecology, Dermatology, Diseases of Children, Diseases of the Nervous System, Genito-Urinary Diseases, Laryngology and Rhinology, and Ophthalmology and Otology. The instruction is intended to meet the requirements of practitioners of medicine, and is almost wholly of a practical character. It includes laboratory courses, demonstrations, beside teaching, and clinical instruction in the wards, dispensary, amphitheatre, and operating rooms of the Hospital. These courses are open to those who have taken a medical degree and who give evidence satisfactory to the several instructors that they are prepared to profit by the opportunities here offered. The number of students who can be accommodated in some of the practical courses is necessarily limited. For these the places are assigned according to the date of application.

The Annual Announcement and Catalogue will be sent upon application. Inquiries should be addressed to the

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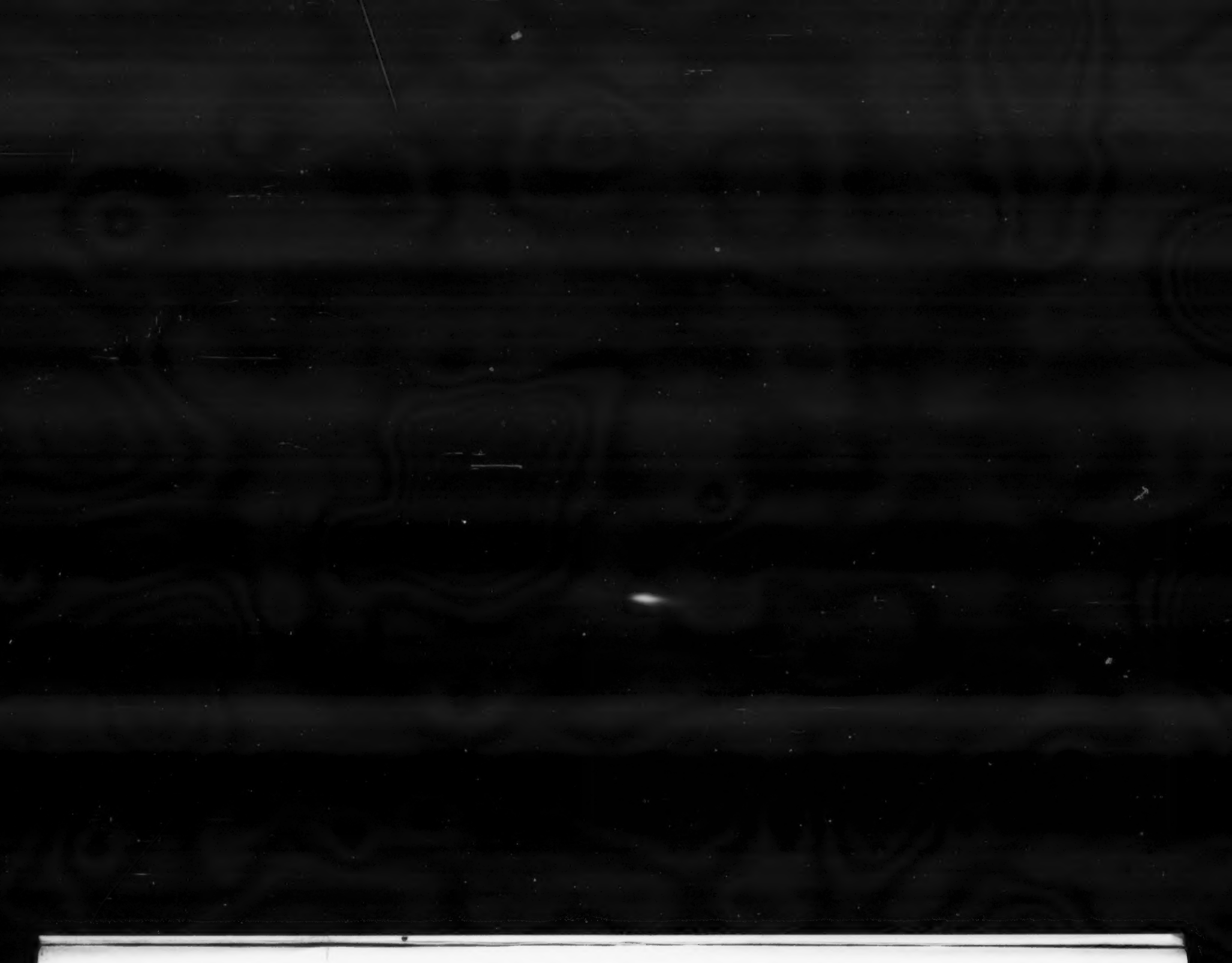
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